

## Fashioned 25G Cannula for Injection of Heavy Liquid during 23G Vitrectomy for Primary Simple Rhegmatogenous Retinal Detachment

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### Authors' contributions

*This work was carried out in collaboration between all authors. The three authors designed altogether the study, Author AAN wrote the protocol, and wrote the first draft of the manuscript. Author MIES managed the literature searches, and author WAE carried out the surgeries with the assistance of the other two authors AAN and MIES. All three authors read and approved the final manuscript.*

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### ABSTRACT

**Purpose:** To evaluate ease of fashioning of 25G cannula, safety and efficacy of injection of heavy liquid using this fashioned cannula during Vitrectomy for simple Rhegmatogenous Retinal Detachment.

**Methods:** This is a prospective non-comparative case series including 28 cases of simple Rhegmatogenous Retinal Detachment (without PVR, with PVR A, B, and C1). A 25G cannula was fashioned by unbending of a 25G Healon cannula. This cannula was applied on the nozzle of a 5 cc syringe filled with perfluorocarbon liquid, and then the heavy liquid was injected inside the vitreous cavity to reattach a detached retina. The outcome measures were: ease of fashioning of the cannula (no cutting off of the shaft), ease of injection (no resistance), need to replace by a back flush needle, iatrogenic retinal breaks / hemorrhage, retinal reattachment.

**Results:** The cannula was fashioned easily without cutting off of the shaft in all cases (100%). There was no resistance or interruption of the stream of heavy liquid through the cannula during

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injection in all cases, and thus no need to replace by an industrialized back flush needle in any case (100%). No iatrogenic retinal breaks or hemorrhages in any case. Complete intraoperative retinal reattachment in all cases (100%).

**Conclusion:** Fashioned 25G cannula is safe and effective for injection of heavy liquids for reattachment of the retina during Vitrectomy for Rhegmatogenous Retinal Detachment. However, further studies are required to evaluate suction function using this fashioned cannula.

**Keywords:** RRD; PVR; perfluorodecalin; healon; 23G; 25G cannula.

## 1. INTRODUCTION

Heavy liquids are used during Vitrectomy for several purposes. For reattachment of detached retina from posterior to anterior, thus allowing for peripheral laser Retinopexy and avoiding the hazards of a posterior drainage retinotomy [1-6]. They are also used for stabilizing the posterior retina to allow for peripheral shaving of vitreous base and addressing peripheral proliferative vitreoretinopathy (PVR). They are used to protect the macula during retrieval of dropped nuclear fragments and in intraocular foreign bodies. They may also be used as hemostatic agents in diabetic Vitrectomy [5-12].

Heavy liquids are usually injected during 23G Vitrectomy using a manufactured 23G back flush needle. It is a homogenous straight blunt tipped metal cannula 22.2 mm long, with 0.75 mm diameter. It is fitted to the nozzle of a 5cc syringe, which is filled with heavy liquid. Then it is introduced through the trocar cannula to the mid-vitreous. The injection process is always safe on retina. It is smooth and sustained enough to reattach the retina during Rhegmatogenous Retinal Detachment [1-10].

Heavy liquids include: Perfluorodecalin (C10F18), perfluorooctane (C8F18), perfluorotributylamine, and perfluoroethylcyclohexane. The most commonly used is Perfluorodecalin.

In this study, we are looking for a credible, cheap, safe, and efficient alternative to the back flush needle, which can help whenever the back flush needle is not available for use. This alternative is achieved by fashioning a 25G cannula from Healon cannula used in cataract surgery.

## 2. MATERIALS AND METHODS

This is a prospective non-comparative study that was done for 28 eyes of 28 patients with simple

Rhegmatogenous Retinal Detachment (RRD). It was carried out at the period from April 2012 to December 2012 at Kasr El Ainy Hospital, Cairo University.

The study and data collection conformed to all local laws and were compliant with the principles of the Declaration of Helsinki. Detailed informed consent was taken from all patients.

Inclusion criteria included: RRD without proliferative vitreoretinopathy (PVR), RRD with PVR A, B, and C1.

### 2.1 Exclusion Criteria Included

RRD with PVR C2-12, RRD due to Trauma or intraocular foreign body (IOFB), Hypotony (intraocular pressure (IOP) < 6 mmHg), Tractional Retinal Detachment (Diabetic or other causes), Exudative Retinal Detachment.

All patients underwent slit lamp examination, IOP measurement using an Applanation Tonometer. Fundus examination was performed using a +90.0 D non-contact lens, and a 3-mirror contact lens.

All patients underwent a 4-port 23G pars plana Vitrectomy. The 4<sup>th</sup> port was used for chandelier illumination. Additional phacoemulsification was performed for phakic eyes. The 25G cannula was fashioned from a Healon cannula (BIOCORNEAL II, 0.5 mm diameter, 22.2 mm long shaft with a bending angle 35°, CROMA, Leobendorf, Austria). A 10/0 suture needle holder was used to fashion the cannula by straightening (unbending) of the shaft. This was done at the bending angle point then at the distal part of the shaft (Fig. 1). This was done gently to avoid cutting - off of the shaft. Then the cannula was fitted to the nozzle of a 5cc syringe filled with heavy liquid. The heavy liquid, which was used, was Perfluorodecalin (Eftiar Decalin, 5 ml vial, DORC, Netherlands). It was injected into the vitreous cavity to reattach the detached retina in

all cases. The infusion cannula was closed during the perfluorodecalin injection, and the surgeon. They were done in the period between April 2012 and December 2012.

The analyzed variables were intraoperative, and they included: ease of fashioning (No cut off), resistance to injection, need to replace by back flush needle, iatrogenic retinal breaks/hemorrhages, and retinal reattachment.

Statistical analysis was done mainly for the baseline characteristics for the mean, range, and standard deviation, and also paired t-test was done to correlate age and baseline IOP to sex. SPSS package 20 was used.



**Fig. 1. 25G Healon cannula before and after unbending**

### 3. RESULTS

The study was done on 28 eyes of 28 cases, of which 13 eyes were right (46.4%), and 15 eyes were left (53.6%). Fourteen cases (14) were females, and 14 cases were males (F: M = 1:1). The mean age of patients was 35 (range, 17-65 years, standard deviation: 15.17). The lens status was as follows: 15 phakic eyes (53.6%), 10 pseudophakic eyes (35.7%), and 3 aphakic eyes (10.7%). The mean preoperative intraocular pressure was 12 (range, 8-16 mmHg, SD: 1.97). All the cases were simple RRD, of which 8 cases had no PVR (28.6%), 14 cases had PVR A-B (50%) and 6 cases had PVR C1 (21.4%).

Fashioning of 25G cannula was easy and not time consuming (mean 23 seconds, range 15-27 seconds), the shaft of the cannula wasn't cut off in all cases (100%), however, the shaft was not perfectly straight, and there was a minimal

optic nerve head was observed for pallor and pulsations. All surgeries were done by the same residual bending angle in all cases (100%). The residual bending impeded entry via the trocar at 1 case, and it was further straightened and introduced easily.

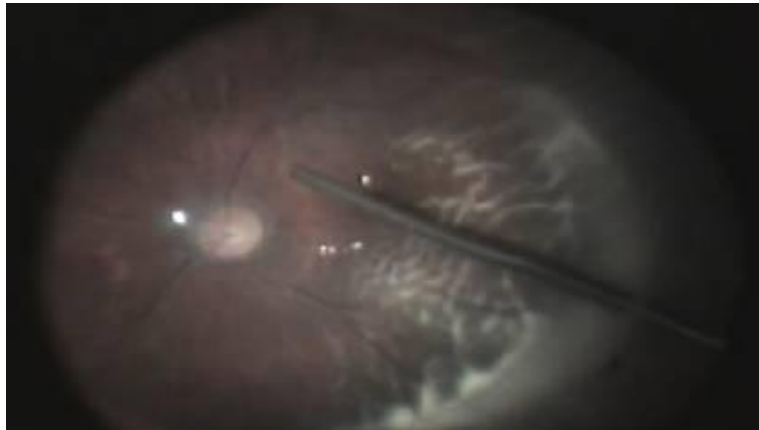
The injection of perfluorodecalin went on smooth, and non-pulsatile in all cases (100%). There was no undue gush of perfluorodecalin during the injection, no iatrogenic retinal breaks or retinal hemorrhage in any case (100%). There was no need to replace the cannula by a manufactured back flush needle in any case. Retina was smoothly and properly reattached, from posterior pole to periphery, with the perfluorodecalin in all cases (100%). There was no optic nerve head pulsation or pallor in any case. (Fig. 2).

### 4. DISCUSSION

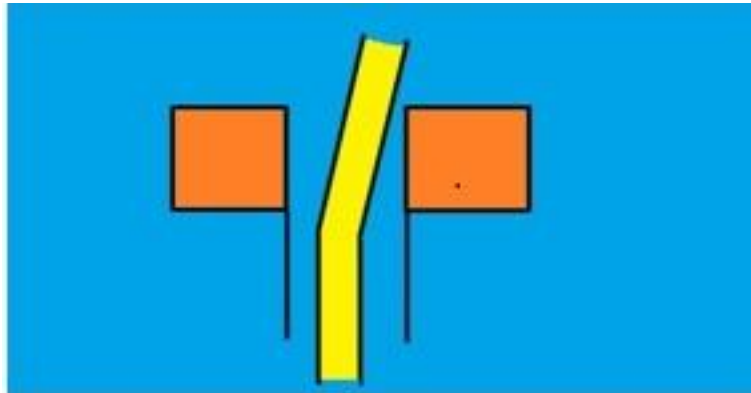
Although scleral buckle was the standard treatment for most of Rhegmatogenous retinal detachment without significant PVR, [11,12] primary pars plana Vitrectomy became more commonly used [1-6]. Heavy liquids are now a substantial tool for 23G Vitrectomy in cases of Rhegmatogenous retinal detachment. They are injected to flatten the posterior pole, allow for proper shaving of vitreous base, prevent retinal incarceration, and thus retina can be flattened and lasered accurately. The instrument, that is usually adopted for heavy liquid injection, is a manufactured back flush needle [5-12].

In our study, we fashioned a blunt cannula for the injection of the heavy liquid. We used a 25G healon cannula, not a 23G cannula (Hydroxy propyl methyl cellulose). This is because the unbending of the Healon cannula is never 100% perfect, and thus the straight shaft of the fashioned cannula is never homogenously straight. There is always a residual bending angle. This makes the overall diameter of the cannula 0.75 mm (23G) rather than the 0.5 mm (25G). This prevents getting locked at entry or exit through the 23G trocar cannula system.

The fashioning of 25G cannula was easy without cutting off in any case, because it was done very gently, using a blunt 10/0 needle holder, it was done on a relatively resilient cannula (Healon), and the unbending process was mainly at the distal part of the shaft, and not on the point of bending which may be the weakest point of the shaft (Fig. 3).



**Fig. 2. Perfluorodecalin injection using fashioned 25G cannula**



**Fig. 3. Residual bending of 25G cannula**

The injection process went on smoothly because it was an active step, and in the direction of gravity. Despite the residual bending, the injection was non-pulsatile. This is because the residual bending didn't occlude the lumen of the shaft.

Retina was properly and smoothly reattached from posterior to peripheral because of the smooth heavy liquid injection, proper removal of peripheral vitreous, in addition to the absence of significant PVR C2-5.

However, the fashioned 25 cannula was not efficient for passive aspiration of PFC. we had to use the 23G back flush needle (passive aspiration) or the 23G vitreous cutter (active aspiration) for PFC aspiration.

## **5. CONCLUSION**

The fashioned 25-gauge cannula is safe and efficient for injection of heavy liquid during vitrectomy for retinal detachment. On the other

hand, it isn't efficient for suction purpose. Further studies are needed for proper evaluation of all possible use of this fashioned cannula. Further studies are also needed for cheap efficient manufactured instruments (like the Dual Bore cannula) for proper comparison.

## **ETHICAL APPROVAL**

All authors hereby declare that all the study have been approved by the appropriate ethical committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration Of Helsinki

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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